

1 **Listing of the Claims**

2 **In the Claims:**

3 Claims 1-33 (Previously Canceled)

4 34. (Previously Presented) A method for detecting a feature using an imaging system, where
5 the feature is part of an object and the feature can be labeled, comprising the steps of:

6 (a) labeling the feature such that a plurality of different optical signaling
7 components become bound to said feature, probes suitable for so labeling the feature comprising:

8 (i) a single type of probe comprising a binding element that selectively
9 binds to at least a portion of the feature, and a plurality of optical signaling components, at least two
10 of which are different, thereby enabling the plurality of different optical signaling components to be
11 bound to said feature; and

12 (ii) two different types of probes, each of which comprises a binding
13 element that selectively binds to at least a portion of the feature, and at least one optical signaling
14 component, such that the optical signaling components of the two different types of probes are not
15 identical, thereby enabling the plurality of different optical signaling components to be bound to said
16 feature;

17 (b) collecting light from said object along a collection path, the light that is collected
18 comprising light corresponding to each of the plurality of different optical signaling components that has
19 been simultaneously collected;

20 (c) dispersing the light that is traveling along the collection path into a plurality of
21 light beams, as a function of a discriminable characteristic enabling the different optical signaling
22 components to be distinguished;

23 (d) focusing each of the plurality of light beams onto a single detector having sufficient
24 pixels to enable a plurality of images to be simultaneously detected, to produce a respective image
25 corresponding to that light beam, thereby simultaneously generating a plurality of images, locations of
26 probes bound to said feature included in the plurality of images being optically discriminated, such that
27 each of the plurality of images are generated on the single detector, wherein an image of each different
28 optical signaling component bound to a single feature is dispersed to a different portion of the detector, such
29 that different optical signaling components are not coincident on the detector, regardless of their relative
30 position on the object;

(e) detecting the plurality of images to produce a signal indicative of each optical signaling component, such that a different signal is produced for each of the plurality of images; and

(f) analyzing each different signal produced for each of the plurality of images to determine if indicative spectral signals produced by the plurality of different optical signaling components are present, thereby establishing that the feature is part of the object.

35. (Previously Presented) The method of Claim 34, wherein the step of labeling the feature comprises the step of exposing said object to the single type of probe, thereby binding said plurality of optical signaling components of the single type of probe to said feature.

36. (Previously Canceled)

37. (Previously Presented) The method of Claim 34, wherein the step of analyzing each different signal produced for each of the plurality of images comprises the step of determining if an intensity of a waveband of light indicative of said plurality of different optical signaling components is present in that image.

38. (Previously Presented) The method of Claim 34, wherein said object comprises a biological cell, and said feature comprises a cellular component.

39. (Previously Presented) The method of Claim 34, wherein the step of analyzing each different signal produced for each of the plurality of images comprises the step of determining if a multiplex of a spectral signature for each of the plurality of different optical signaling components is present in that image, such that the following spectral signatures can be differentiated, where A corresponds to a first optical signaling component, and B corresponds to a second optical signal component, where light defining all such spectral signatures has been simultaneously collected:

- (a) a spectral signature comprising A-A-A-B;
- (b) a spectral signature comprising A-A-B-B; and
- (c) a spectral signature comprising A-B-B-B.

40. (Previously Presented) The method of Claim 34, wherein the step of labeling the feature comprises the step of exposing said object to the two different types of probes, thereby binding the plurality of different optical signaling components of the two different types of probes to said feature.

41. (Previously Canceled)

III

1 42. (Previously Presented) A method for probing an object with probes to detect if any of a
2 plurality of specific features are part of the object, using an imaging system, wherein such probes can
3 be attached to each such feature, the method comprising the steps of:

4 (a) for each specific feature to be detected, providing each type of probe required
5 to uniquely label each specific feature that is part of the object, types of probes suitable for so
6 labeling each specific feature comprising:

7 (i) one type of probe including a binding element that selectively binds to
8 the feature, and a plurality of optical signaling components, at least two of which are different,
9 thereby enabling the plurality of different optical signaling components to be bound to said feature;
10 and

11 (ii) two different types of probes, each of which includes a binding element
12 that selectively binds to at least a portion of the feature, and at least one optical signaling component,
13 such that the optical signaling components of the two different types of probes are not identical,
14 thereby enabling the plurality of different optical signaling components to be bound to said feature;

15 (b) exposing said object to each type of probe required to uniquely label each
16 specific feature that is part of the object;

17 (c) collecting light from said object along a collection path, the light that is collected
18 comprising light corresponding to each optical signaling component used to label the plurality of specific
19 features that are part of the object, such light having been simultaneously collected;

20 (d) dispersing the light that is traveling along the collection path into a plurality of
21 light beams, as a function of a wavelength, such that each different light beam corresponds to a
22 different wavelength of light;

23 (e) focusing each of the plurality of light beams corresponding to a different
24 wavelength onto a different portion of a single detector, to produce a respective image corresponding to that
25 wavelength, thereby simultaneously generating a plurality of images on the single detector, locations of
26 probes bound to said feature included in the plurality of images being optically discriminated, such that
27 each different one of the plurality of light beams is dispersed onto a different portion of the detector, so each
28 pixel of each respective image having the same wavelength is received at the same portion of the
29 detector, while being spaced apart from each pixel of each respective image having a different
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1 wavelength, such that pixels of different wavelengths corresponding to an identical portion of the
2 object are not coincident;

3 (f) detecting the plurality of images to produce a signal indicative of each optical
4 signaling component present in the plurality of images and used to uniquely label each specific
5 feature that is part of the object, such that a different signal is produced for each of the plurality of
6 images; and

7 (g) analyzing the signals produced for each of the plurality of images to determine
8 which specific feature is part of the object.

9 43. (Previously Presented) The method of Claim 42, wherein at least one specific feature to
10 be detected is labeled with the one type of probe including the plurality of optical signaling
11 components.

12 44. (Previously Presented) The method of Claim 42, wherein said object comprises a
13 biological cell, and each feature comprises a cellular component.

14 45. (Previously Canceled)

15 46. (Previously Presented) The method of Claim 42, wherein at least one specific feature to
16 be detected is labeled with the two different types of probes including the optical signaling
17 components that are not identical.

18 47. (Previously Canceled)

19 48. (Previously Canceled)

20 49. (Previously Presented) The method of Claim 42, wherein each optical signaling
21 component comprises a fluorescent dye, further comprising the step of directing sufficient energy
22 toward said object, such that the fluorescent dye is excited to emit a fluorescent light comprising a
23 uniquely discriminable characteristic of the optical signaling component.

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1 50. (Previously Presented) The method of Claim 42, wherein the step of analyzing each
2 different signal produced for each of the plurality of images comprises the step of determining if a
3 multiplex of a spectral signature for each of the plurality of different optical signaling components is
4 present in that image, such that the following spectral signatures can be differentiated, where A
5 corresponds to a first optical signaling component, and B corresponds to a second optical signal
6 component, where light defining all such spectral signatures has been simultaneously collected:

- 7 (a) a spectral signature comprising A-A-A-B;
8 (b) a spectral signature comprising A-A-B-B; and
9 (c) a spectral signature comprising A-B-B-B.

10 51. (Previously Presented) The method of Claim 42, wherein at least one specific feature is
11 uniquely discriminable based on a spectral composition of light from a plurality of optical signaling
12 components bound to that at least one specific feature.

13 52. (Previously Canceled)

14 53. (Previously Canceled)

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1 54. (Previously Presented) A method for detecting a feature using an imaging system, where
2 the feature is part of an object and the feature can be uniquely labeled, comprising the steps of:

3 (a) labeling the feature such that a plurality of different optical signaling
4 components become bound to said feature, types of probes suitable for so labeling each specific
5 feature comprising:

6 (i) a single type of probe including a binding element that selectively binds
7 to the feature, and a plurality of optical signaling components, at least two of which are different,
8 thereby enabling the plurality of different optical signaling components to be bound to said feature;
9 and

10 (ii) two different types of probes, each of which includes a binding element
11 that selectively binds to at least a portion of the feature, and at least one optical signaling component,
12 such that the optical signaling components of the two different types of probes are not identical,
13 thereby enabling the plurality of different optical signaling components to be bound to said feature;

14 (b) collecting light from said object along a collection path, while there is relative
15 motion between the object and an apparatus employed to collect the light, the light that is collected
16 comprising light corresponding to each of the plurality of different optical signaling components that has
17 been simultaneously collected, such that the collection path is substantially orthogonal to an axis of the
18 relative motion, a field angle in object space along the collection path being sufficiently small so as to
19 enable light collected from the object to be spectrally dispersed onto a single detector;

20 (c) spectrally dispersing the light that is traveling along the collection path into a
21 plurality of light beams, as a function of a wavelength;

22 (d) focusing each of the plurality of light beams to produce a respective image
23 corresponding to that light beam on the single detector, thereby simultaneously generating a plurality of
24 spectrally distinguishable images on the single detector each different spectral image being dispersed onto a
25 different portion of the detector, such that pixels of different spectral images corresponding to an
26 identical portion of the object are not coincident;

27 (e) detecting the plurality of images to produce a signal indicative of each optical
28 signaling component, such that a different signal is produced for each of the plurality of images; and

(f) analyzing each different signal to determine if a spectral component due to each optical signaling component bound to said feature is present in the image, thereby establishing that said feature is part of the object.

55. (Previously Canceled)

56. (Previously Presented) A method for detecting a feature using an imaging system, where the feature is part of an object and the feature can be uniquely labeled, comprising the steps of:

(a) labeling the feature such that a plurality of different optical signaling components become bound to said feature;

(b) collecting light from said object along a collection path, while there is relative motion between the object and an apparatus employed to collect the light, the light that is collected comprising light corresponding to each of the plurality of different optical signaling components and being simultaneously collected;

(c) spectrally dispersing the light that is traveling along the collection path into a plurality of light beams such that light from different optical signaling components is included in different ones of plurality of light beams;

(d) focusing each of the plurality of light beams onto a different portion of a single detector to produce a respective image corresponding to that light beam, thereby simultaneously generating a plurality of spectral images on the single detector, such that each different spectral image is dispersed onto a different portion of the detector, such that pixels of different spectral images corresponding to an identical portion of the object are not coincident;

(c) detecting the plurality of images to produce a signal indicative of each optical signaling component, such that a different signal is produced for each of the plurality of images; and

(f) analyzing each different signal produced for each of the plurality of images to determine if indicative spectral signals produced by the plurality of different optical signaling components are present, thereby establishing that the feature is part of the object.

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1 57. (Previously Presented) The method of Claim 56, wherein the step of labeling the feature
2 such that a plurality of different optical signaling components become bound to said feature
3 comprises the step of exposing the object to a single type of probe comprising a binding element that
4 selectively binds to at least a portion of the feature, and a plurality of optical signaling components, at
5 least two of which are different, thereby enabling the plurality of different optical signaling
6 components to be bound to said feature.

7 58. (Previously Presented) The method of Claim 56, wherein the step of labeling the feature
8 such that a plurality of different optical signaling components become bound to said feature
9 comprises the step of exposing the object to two different types of probes, each of which comprises a
10 binding element that selectively binds to at least a portion of the feature, and at least one optical
11 signaling component, such that the optical signaling components of the two different types of probes
12 are not identical, thereby enabling the plurality of different optical signaling components to be bound
13 to said feature.

14 59. (Previously Canceled)

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1 60. (Previously Presented) A method for probing an object with probes to detect if any of a
2 plurality of specific features are part of the object, using an imaging system, wherein such probes can
3 be attached to each such specific feature, the method comprising the steps of:

4 (a) for each specific feature to be detected, providing each type of probe required
5 to uniquely label each specific feature that is part of the object, types of probes suitable for so
6 labeling each specific feature comprising:

7 (i) plural signaling probes, each plural signaling probe comprising a
8 binding element that selectively binds to at least a portion of said specific feature, and a plurality of
9 optical signaling components, at least two of which are different, thereby enabling a plurality of
10 different optical signaling components to be bound to said specific feature if said specific feature is
11 part of the object; and

12 (ii) mono signaling probes, each mono signaling probe comprising a
13 binding element that selectively binds to at least a portion of said specific feature, and one optical
14 signaling component, such that two different types of mono signaling probes, each different type
15 including a different optical signaling component, are needed to enable a plurality of different optical
16 signaling components to be bound to said specific feature if said specific feature is part of the object;

17 (b) exposing said object to each type of probe required to uniquely label each
18 specific feature that is part of the object;

19 (c) collecting light from said object along a collection path, the light that is collected
20 comprising light corresponding to each optical signaling component used to label the plurality of specific
21 features that are part of the object, such light having been simultaneously collected;

22 (d) spectrally dispersing the light that is traveling along the collection path into a
23 plurality of light beams as a function of a plurality of different discriminable characteristics of the
24 light;

25 (e) focusing each of the plurality of light beams onto a different portion of a single
26 detector, to produce a respective image corresponding to that light beam, thereby simultaneously generating
27 a plurality of spectral images on the single detector, locations of probes bound to said feature included in
28 the plurality of images being optically discriminated, such that each different spectral image is dispersed
29 onto a different portion of the detector, such that pixels of different spectral images corresponding to an
30 identical portion of the object are not coincident;

1 (f) detecting the plurality of images to produce a signal indicative of each optical
2 signaling component present in the plurality of images and used to uniquely label each specific
3 feature that is part of the object, such that a different signal is produced for each of the plurality of
4 images; and

5 (g) analyzing the signals produced for each of the plurality of images to determine
6 which specific feature is part of the object.

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1 61. (Previously Presented) A method for detecting a feature using an imaging system, where
2 the feature is part of an object and the feature can be uniquely labeled, comprising the steps of:

3 (a) labeling the feature such that a plurality of different optical signaling
4 components become bound to said feature, the feature being labeled using either:

5 (i) one type of probe including a binding element that selectively binds to
6 the feature, and a plurality of optical signaling components, at least two of which are different,
7 thereby enabling the plurality of different optical signaling components to be bound to said feature; or

8 (ii) two different types of probes, each of which includes a binding element
9 that selectively binds to at least a portion of the feature, and at least one optical signaling component,
10 such that the optical signaling components of the two different types of probes are not identical,
11 thereby enabling the plurality of different optical signaling components to be bound to said feature;

12 (b) collecting light from said object along a collection path, while there is relative
13 motion between the object and an apparatus employed to collect the light, the light that is collected
14 comprising light corresponding to each of the plurality of different optical signaling components that has
15 been simultaneously collected;

16 (c) spectrally dispersing the light that is traveling along the collection path into a
17 plurality of light beams as a function of a plurality of different discriminable characteristics of the
18 light;

19 (d) focusing each of the plurality of light beams onto a different portion of a single
20 detector to produce a respective image corresponding to that light beam, thereby simultaneously generating
21 a plurality of spectral images on the single detector, such that each different spectral image is dispersed onto
22 a different portion of the detector, such that pixels of different spectral images corresponding to an
23 identical portion of the object are not coincident;

24 (e) detecting the plurality of images to produce a signal indicative of each optical
25 signaling component, such that a different signal is produced for each of the plurality of images; and

26 (f) analyzing each different signal to determine if a spectral component due to
27 each optical signaling component bound to said feature is present in the image, thereby establishing
28 that said feature is part of the object.